

REMARKS

Claims 1-19 are pending in the application, are rejected, and are at issue.

Applicants have amended the specification herein with respect to the requested corrections.

Applicants traverse the objection to claim 7 as not further limiting claim 1. Claim 1 specifies detecting an error condition responsive to sensed AC line voltage being substantially different from motor winding terminal voltage in the off mode. Claim 7 specifies detecting an error condition responsive to sensed AC line voltage having a substantially different voltage level for motor winding terminal voltage level in the off mode. The addition of the word level further limits claim 7 relative to claim 1.

The present invention is directed to a system and method for fault contactor detection. The fault contactor includes contacts connected with power switches and motor winding terminal. When the fault contactor is off, the contacts are open. Normally in a motor wiring system the fault contactor is on so that the contacts are closed. The fault contactor is used to open the path for current to the motor in instances where the soft starter might fail. There can be instances where the fault contactor coil is not wired properly which could result in a condition where the fault contactor does not open in a fault condition. Also, if the fault contacts are welded, the contacts would also be in the on state, i.e., closed, even when the fault contactor is directed to be off. The present invention is directed to a system and method for detecting improper fault contactor operation.

Applicants traverse the rejection of claims 1-4, 7-11 and 14-16 as anticipated by Johnson U.S. Patent No. 6,038,114.

Claim 1 specifies a motor controller system comprising power switches for connection to an AC line for controlling application of AC power to a motor. A fault contactor has contacts. A motor wiring circuit operatively connects the power switches and fault contactor contacts with motor winding terminals. Voltage sensors sense AC line voltage and motor winding terminal voltage. A control circuit controls operation of the switches and the fault contactor. The control circuit de-energizes the fault contactor in an off mode where AC line power is not supplied to the motor winding terminals. The control circuit measures AC line voltage and motor winding voltage terminal in the off mode and detects an error condition responsive to sensed AC line voltage being substantially different from motor winding terminal voltage in the off mode.

An anticipation can be established only by a single prior art reference disclosing each and every element of the claimed invention, arranged as in the claim. Johnson does not anticipate claim 1. Particularly, Johnson does not disclose or suggest a control circuit de-energizing a fault contactor in an off mode. Nor does it disclose detecting an error condition responsive to sensed AC line voltage being substantially different from motor winding terminal voltage in the off mode.

Like the present invention, Johnson is directed to a circuit for error detection in a motor controller. However, Johnson is directed to detecting three specific errors using a logic decoding circuit. The logic decoding circuit, shown in Fig. 6, detects voltages across the

switches and the different combinations of the line to line voltages. The logic circuit determines if these voltages are zero or non-zero. Knowing expected relationships of these various voltages with proper wiring, the circuit evaluates whether the zero or non-zero conditions match what is expected and if not, if they match the conditions for any of the three error conditions being detected. None of the conditions detected relate to fault contacts being closed when they should be open.

The action states that Johnson discloses de-energizing the fault contactor in an off mode. There is no disclosure or suggestion of the same in Johnson. Johnson does state at col. 11, lines 33-37 that the error detection occurs prior to turning on the delta motor. However, turning on the motor relates to controlling switch operation. It does not imply that the fault contactor contacts are open. Indeed, in discussing the various conditions being detected, the specification suggests that the fault contactor contacts are closed. For example, discussing Fig. 5 at col. 6, lines 38-52, the specification states, e.g., that “winding W1 has both terminals T1 and T4 electrically coupled to line voltage terminal L2. . .”. Terminal T4 can only be electrically coupled to the line voltage terminal L2 if the fault contact FC1 is in a closed condition. A similar discussion relative to Fig. 9 is provided at col. 9, lines 20-39.

As such, Johnson not only does not disclose that the fault contactor is off, but implies that its contacts are closed and thus the fault contactor is on. Regardless, the error detection in Johnson does not relate to whether or not the contacts are open or closed, but rather specific wiring errors. Because this limitation is not present in Johnson, there can be no anticipation.

The Office action also states that Johnson discloses detecting an error condition responsive to sensed AC line voltage being substantially different from motor winding terminal voltage in the off mode. In fact, Johnson never detects for any substantial difference between AC line voltage and motor terminal voltage. The sensing circuit of Fig. 6 in Johnson is discussed at col. 7. As is apparent, the circuit is evaluating whether the line to terminal voltages are equal to zero or greater than zero. For the voltage to be considered zero, the measured voltage is greater than -0.1 volts and less than +0.1 volts. A difference of 0.1 volt between a line voltage and terminal voltage, intended to measure whether the switch is on or off, does not represent sensed AC line voltage being substantially different from motor winding terminal voltage in the off mode, as recited in claim 1.

In the context of the present invention, as outlined in the specification, a substantial difference is detected with a fault contactor in an off mode. For a delta winding configuration, shown in Table 1 at page 9, the line to neutral voltage and the terminal to neutral voltages are approximately equal in level and phase. When the contactor is on, i.e., the contact closed, the voltages are 120° out of phase. This is one substantial voltage difference. In the implementation of an in-line configuration, represented in Table 2 at page 11, the terminal to neutral voltage is zero compared to 266 volts for the line to neutral voltage. This is another substantial voltage difference. Johnson does not consider any such substantial voltage difference as it is simply looking for desired zero or non-zero relationships between voltages across individual control switches and the three line to line voltages.

Thus, because Johnson does not disclose detecting an error condition responsive to the sensed AC line voltage being substantially different from motor winding terminal voltage in the off mode, there is no anticipation for this reason as well.

The logic detection circuit of Johnson looking at desired zero and non-zero states of these voltage relationships is distinct from that described and claimed herein. For this reason, Johnson is not related to the claimed invention. Therefore, any obviousness rejection would also be improper.

Claims 2-4 and 7 depend from claim 1 and are not anticipated for the same reasons. Also, claim 2 specifies the voltage sensor sense AC line to neutral voltage and motor winding terminal to neutral voltage. There is no such disclosure or suggestion in Johnson which detects line to terminal voltage, i.e., voltage across the switches, and line to line voltage. Claim 2 is not anticipated for this reason as well.

Claim 7 depends on claim 6 which is not rejected as anticipated. Claim 7 is not anticipated for this reason as well.

Independent claim 8 specifies a motor starter system including, *inter alia*, a control circuit for controlling operation of solid state switches and a fault contactor, including de-energizing the fault contactor in an off mode where AC line power is not supplied to the motor winding terminals. The control circuit detects AC line voltage and motor terminal voltage in the off mode and detects an error condition responsive to sensed AC line voltage being substantially different from motor terminal voltage in the off mode.

Claim 8 is not anticipated or obvious over Johnson for the same reasons discussed above relative to claim 1. Likewise, claims 9-11 and 14 are not anticipated. Lack of anticipation of claims 9 and 14 is further evident for the same reasons discussed above relative to claims 2 and 7, respectively.

Independent claim 15 specifies a method of fault contactor detection prior to motor starting comprising, *inter alia*, controlling operation of solid state switches and a fault contactor prior to motor starting, including de-energizing the fault contactor in an off mode where AC line power is not supplied to the motor winding terminals, detecting AC line voltage and motor terminal voltage in the off mode and detecting an error condition responsive to sensed AC line voltage being substantially different from motor terminal voltage in the off mode.

Claim 15 is not anticipated for the same reasons as discussed above relative to claim 1. Claim 16 depends on claim 15 and is likewise not anticipated.

For the above reasons, claims 1-4, 7-11 and 14-16 are not anticipated by Johnson and a rejection is improper and ought be withdrawn.

Applicants traverse the rejection of claims 6, 13 and 18 as obvious over Johnson. Claims 6, 13 and 18 depend from claims 1, 8 and 15. As noted above, the independent claims are not obvious over Johnson. Therefore, the dependent claims would likewise not be obvious. Moreover, these claims relate to the motor wiring circuit electrically connecting the power switches and fault contactor contact in line with the motor windings. The basis for the obviousness rejection is that Y configurations and delta configurations are art recognized equivalents. There is no support for such a statement. The circuits are not equivalent. The logic

circuit of Johnson is specifically directed to detecting certain conditions in a delta motor controller. Indeed, the detected conditions of a single delta motor winding wired in a dead ended configuration, all three delta motor windings wired in dead ended configurations and a swapped lead configuration where the delta motor leads intended for connection to the motor controller have been swapped with the delta motor leads intended for connection to the fault contactor, would not be detected with an in-line configuration. Thus, Johnson clearly does not suggest the invention of claims 6, 13 and 18 and the rejection ought be withdrawn.

Applicants traverse the rejection of claims 5, 12, 17 and 19 as obvious over Johnson in view of Kim et al. U.S. Patent No. 5,684,377. These claims relate to detecting an error condition responsive to sensed AC line voltage having a different phase relationship for motor terminal voltage in the off mode, except claim 19 which relates to substantially different voltage level.

Kim is cited for using different phase measurements to control firing angle. This is unrelated to error detection. Johnson relates to a logic circuit for error detection determining whether the sensed voltages are zero or non-zero. Johnson does not detect phase relationships. It is detecting altered voltage states. Moreover, the error detection in Johnson is done with switches off. The use of phase measurements to control firing angle is implemented to turn switches on. Thus, it has no application to Johnson. Therefore, the combination is improper.

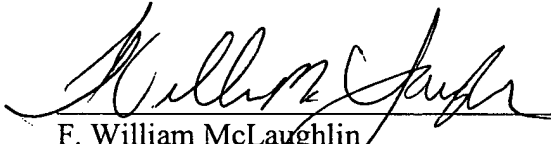
For the above reasons, claims 5, 12, 17 and 19 are believed allowable and withdrawal of the rejection is requested.

Summarizing, Johnson is directed to a logic circuit detecting altered zero and non-zero states of voltages across switches and in line to line relationships to detect specific miswings in a delta motor configuration. It does not relate to fault contactor detections which detect substantial differences between line voltages and terminal voltage in an off mode when the fault contactor is de-energized.

Reconsideration of the application and allowance and passage to issue are requested.

Respectfully submitted,

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